

REMARKS

Applicants thank the Examiner for the Office Action of July 20, 2009. This Amendment is in full response thereto. Thus, Applicants respectfully request continued examination and allowance of the application.

Claims 28, 30-31, 34-36, and 38 are pending in this application.

Drawing Objections

The drawings are objected to because the coaxial feature of the ducts of claim 37 were not shown. Claim 37 has been canceled thereby mooting the objection.

Claim Rejections Under 35 U.S.C. § 112:

Claim 37 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 37 has been canceled thereby mooting the rejection.

First Claim Rejection Under 35 U.S.C. § 103:

Claims 28, 30, 34, 37 and 38 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Iatrides, et al. (USPN 5,743,723), further in view of Baysinger (USPN 4,034,911). Claim 37 has been canceled thereby mooting the rejection as to that claim. With respect to claims 28, 30, 34, and 38, Applicant respectfully traverses because Iatrides, et al. and Baysinger, alone or in combination, fail to disclose, teach or suggest all of the limitations of the claimed subject matter, including a flow rate control device adapted to control said additional gas's flow rate, wherein said flow rate control device is slaved to said flow rate measurement device so that a sum of the additional gas, oxygen and fuel flow rates are greater than a preset minimum flow rate D_{MIN} , wherein D_{MIN} is the minimum flow rate through the burner required for cooling the burner during combustion so as to prevent structural thermal damage to the burner

As explained in the patent specification at line 34 of page 5 through line 3 of page 6:

“The value of DMIN may be set for each type of burner according to the flow rate of the fuel introduced into the burner. More precisely, the value of DMIN may be set in the following manner: DMIN must be sufficient to cool the burner. This flow rate value needed for cooling is specific to the burner used; it can be determined by a person skilled in the art according to the withstand temperature of the said burner. This burner withstand temperature is itself determined beforehand by tests.”

In high-temperature environments, it is a problem with oxy-fuel burners, when compared with air-fuel burners, that the overall flow rate through the burner is much smaller. Indeed, in operation, a burner will receive heat (by radiation, convection and conduction) from the combustion zone. When the temperature in the combustion zone is higher than the withstand temperature of the burner, care has to be taken that the burner does not overheat, i.e. reaches a temperature above its withstand temperature.

In the case of an air-fuel burner, the above is not usually a problem due to the cooling effect of the air flow through the burner. In operation, the flow of fuel through the burner is determined by the power (heat) which the burner is expected to supply to the combustion zone. The air flow through the burner is then determined by the amount of oxygen required to combust the fuel. As oxygen constitutes only a minor portion of air (the remainder being mainly nitrogen), the volumetric air flow through the burner is well in excess of the volume of oxygen required to combust the fuel. As the air flows through the burner, it cools the burner and the burner remains below its withstand temperature.

On the other hand, In the case of an oxy-fuel burner, the oxidant flow through the burner is much reduced. For example, when the burner is operated with pure oxygen, the oxidant flow through the burner is restricted to the amount of oxygen required to combust the fuel. In high-temperature environments, the oxidant flow through the oxy-fuel burner is insufficient to provide the necessary cooling of the

burner (together with the cooling effect from the fuel flow through the burner), ultimately leading to burner overheating and failure.

The claimed subject matter overcomes the above-recited problem by flowing through the burner:

- the fuel flow necessary for providing the required power,
- the oxygen flow required to combust the fuel and
- an additional-gas flow required for the cooling of the burner (in addition to the fuel and oxygen flows), i.e. required to maintain the burner below its withstand temperature, which is the case when the total flow rate through the burner is in excess of D_{MIN} .

The use of a flow rate control device to control the flow rate of the additional gas so that the sum of the additional gas, oxygen and fuel flow rates is in excess of D_{MIN} , whereby D_{MIN} corresponds to the minimum total flow rate required for cooling the burner is not rendered obvious by Iatrides, et al. and Baysinger.

Baysinger discloses a burner control system for a boiler, whereby, when the temperature of the boiler outlet water is too low (i.e. when the power supplied by the burner to the boiler is insufficient), the gaseous fuel flow to the burner is increased so as to increase the power output by the burner. Increasing the gaseous fuel flow through the burner so as to increase the burner output, thereby increasing the temperature in the combustion zone clearly does not solve the problem of insufficient cooling of an oxy-fuel burner in high temperature environments, as may occur when the burner operates at low power.

Thus, the rejection should be withdrawn.

Second Claim Rejection Under 35 U.S.C. § 103:

Claims 31, 35 and 36 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Iatrides, et al. (USPN 5,743,723), in view of Baysinger (USPN 4,034,911), further in view of Versluis (USPN 5,630,408). Applicant respectfully

traverses because Iatrides, et al. and Baysinger fail to disclose, teach or suggest all of the limitations of the claimed subject matter (as discussed above) and because Versluis fails to cure that deficiency. Versluis discloses a gas/air ratio control apparatus operating which detects the water temperature and controls the air supply to the burner in function of said water temperature and whereby the fuel supply to the burner is controlled in function of the pressure in the air supply line to the burner. The Versluis apparatus allows the burner to operated over a wider range than prior art systems (20% to 100% instead of 45% to 100%) and limits the emission of harmful substances by always ensuring a sufficient air supply for complete combustion. In column 3, lines 62 to 64 of Versluis, it is stated that "regulation is carried out at a fuel/air mixture of 1:1". In column 4, lines 2 to 9, it is further stated that "the oxygen level in the combustion gases is maintained constant". Consequently, Versluis discloses the proportional control of fuel and air flows. When the water temperature is too low, the air flow to the burner is increased and the fuel flow to the burner is increased proportionally to the air flow. When the water temperature is too high, the air supply to the burner is decreased and the fuel supply to the burner is decreased proportionally. There is no disclosure of the supply of a flow of additional gas to the burner if the total flow of fuel and air were to be insufficient for cooling the burner. Indeed, as explained above, such a problem doesn't normally arise with air-fuel burners.

Thus, the rejection should be withdrawn.

CONCLUSION

Accordingly, it is believed that the present application now stands in condition for allowance. Early notice to this effect is earnestly solicited. Should the examiner believe a telephone call would expedite the prosecution of the application, he/she is invited to call the undersigned attorney at the number listed below.

A Petition for a Two Month Extension of Time has been contemporaneously submitted with this Amendment along with the associated fee. Otherwise, it is

believed that no other fee is due at this time. If that belief is incorrect, please debit deposit account number 01-1375. Also, the Commissioner is authorized to credit any overpayment to deposit account number 01-1375.

Respectfully submitted,

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